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ABSTRACT

A questionnaire concerning attitudes toward the importance of communication skills and toward different modes of communication was administered to 290 incoming freshmen at the National Technical Institute for the Deaf. Students responded to one of two types of a 38-item questionnaire: a multiple choice, or Likert-type (strongly agree...strongly disagree) format. Factor scales and subscales underlying the questionnaire items were developed; T-tests were conducted for each of the twelve subscales by response format, to examine mean difference due to format. Group discriminant analyses were also conducted, to determine if format could be predicted by subscale score. Finally, multiple regression analyses were performed for each format, using the four importance-of-skills subscales as predictors, and the desire-for-more-training and perceived-skill scales as the criterion. T-test, discriminant, and reliability analyses revealed no significant differences between the two response formats, although there were slight advantages for subscales of the Likert format. The Likert format was more advantageous, according to regression analysis, in predicting most of the subscales. It was also noted that students completed Likert scales in one-third to one-half the time required for multiple choice tests. (Both forms are appended) (GDC)

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The Impact of Item Format On Deaf Students' Responses to an Attitude Questionnaire

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Abstract

This study examined a topic that has been frequently mentioned, but seldom explored, in research concerning the use of opinion and attitude instruments with a deaf population--the impact of item format on subject responses. Data was collected from 290 deaf students, half of whom completed an instrument with Likert items and half of whom completed the same instrument using a multiple choice format. Preliminary results favor the use of the Likert response format. Although internal consistency coefficients were essentially identical, the Likert response format showed a simpler factor analysis structure and a stronger relationship between perceived importance of a particular communication mode and desire for additional training in that communication mode.

The research reported in this paper was carried out under an agreement with the U.S. Department of Health, Education and Welfare.

Introduction

The problems of the use of psychological tests with a deaf population have been well documented (Garrison, 1978; Rosen, 1967). However, most of this research has concentrated on the difficulties with the syntax and vocabulary encountered by the deaf when standard psychological tests are employed. Garrison, et al. (1978) found that many deaf students made "idiosyncratic interpretations" of the items on the Tennessee Self Concept Scale and hence obtained results that falsely indicated psychological maladjustment. Trybus (1973) noted that previous research has demonstrated that the greatest problem in the psychological evaluation of the hearing impaired is that of the language level of the test items.

The primary focus of this earlier research has been on the psychological assessment of the hearing impaired. The goal of such work was usually the identification of students in need of special therapy or counseling. At times there was the desire to compare deaf and hearing populations on certain personality characteristics.

Recently, however, with the increased emphasis on the design of instructional materials and instructional experiences specifically geared to a deaf population there has come an increased interest in general opinion or attitude instruments. The data from such questionnaires and rating scales would be used not to prescribe special counseling but to describe deaf students' attitudes and opinions about a wide variety of topics. Frequently, such topics would include students' perceptions of various communication modes, student opinions of their instructional experiences, student opinions of the perceived importance

of certain training, etc. Such information would have the ultimate aim of designing new instructional experiences, and improving existing instructional experiences for deaf students.

The amount of polemic and experimental investigation in the areas of attitude and opinion measures with the hearing population is, of course, immense. But, although some work has been done with deaf populations, deaf students' attitudes and opinions have not been subjected to the intense scrutiny as have the opinions of hearing students. Nor have the problems of constructing and formating scales for the measurement of such attitudes and opinions of deaf students been as thoroughly examined.

Noble (1978) reviewed a variety of studies that utilized self-report instruments to assess hearing loss. But the focus of all of these studies (Silverman, et al., 1948; Lindeman, 1969; Schein, et al., 1970; Pearson, Keel, & Taylor, 1975; High, Fairbanks, & Glorig, 1964) was the comparison of self-report scales to audiological measures of hearing loss. Little, if any, emphasis was placed on questions of item format. Yet we know from the literature using hearing populations that item wording and response format can make an impact on the responses we receive.

Finn (1972) reported that both the means and the reliabilities of ratings were affected by the number of scale levels (i.e., number of response categories). Follman (1974) found mean differences in student ratings of instructors due to differences in the rating scale keys (e.g., Unsatisfactory - Excellent; Strongly Disagree - Strongly Agree; Needs Improvement - Needs No Improvement). Follman also found differences between negatively and positively worded items (e.g., Instructor knows the material well - Instructor knows the material poorly).

Frisbie and Brandenburg (1979) reported that they found that rating scale items are not equivalent if only the endpoints of the response scale are defined rather than all scale points.

On a more positive note, however, Dawes (1977) noted that there is reason not to give up on rating scales altogether. Dawes reported that if we measured height with rating scales instead of rulers, we would end up with numbers very highly correlated with physical height. The key is to continue to investigate the use of a variety of rating devices with a deaf population in order to increase our knowledge of the effect of various item wordings and response formats on the respondents' answers. Balton (1971), for example, found that the Semantic Differential offers promise as a self-report technique for assessing work attitudes, needs and values. Two of the Semantic Differential Scales (Evaluation and Potency) produced reliability coefficients comparable to those found with hearing populations. The third factor (activity) was found to have low reliability with the deaf population used in his study.

Two item formats frequently used to collect attitude and opinion information are the Likert response format and the simple multiple choice item. The Likert format requires the student to select from (usually) five alternatives frequently of the form "strongly agree" to "strongly disagree." The multiple choice format asks the student to circle the response that best completes the stem statement or stem question. The Likert format has the advantage of simplicity. Once the students understand the format they can quickly respond to a rather large number of items. The disadvantage of the Likert is the restricted format; all stems must be a simple statement and hence, students can

easily fall into a response "set" (e.g., checking all "agree"). The multiple choice format allows for more flexibility of stems and response options, but requires a great deal more reading and hence is slower to administer and--with the language problems of many deaf students--more subject to problems of erroneous interpretations.

This study will examine one currently unexplored topic in the area of attitude and opinion measurement of deaf students--that of the impact of item format on students' responses.

Methods and Data Sources

Approximately 290 incoming freshman attending the 1978 Summer Vestibule Program at the National Technical Institute for the Deaf (NTID) participated in this study. The Summer Vestibule Program is a six-week orientation program for all NTID entering freshmen. The students participating in the study were all enrolled in a five-week course entitled "Introduction to Communication." On the first day of the course, students were administered an opinion survey consisting of 38 items covering these topics: students' perception of their communication skills, students' perception of the importance of communication skills, and students' desire for further training in communication skills.

One-half of the students received the items in a five-option Likert response format and the other half received the exact same items in a multiple choice format. Wording for each item pair on the two formats was kept as consistent as possible. Since the students were taught in class sections of approximately 20 students each and students were assigned to class sections based on their communication skills, the two formats were randomly distributed within each class section.

Students were also administered the same questionnaire in the same manner at the end of the course. However, the post-course data is not reported or used in this paper.

This report is one of a series that will be generated on specific aspects of students' perceptions of various communication modes. The other reports will focus on the relationship of expressed student attitudes and a variety of student characteristics, examine the relationship between students' perceptions of their abilities and their actual abilities as measured by a variety of methods employed at NTID, and examine the relationship between students' expressed desire for communication skills training and the perceived importance of communication skills.

Instrumentation

Seven modes of communication used by students at NTID were identified. These seven modes were: speaking, listening, speechreading, reading, writing, reception of manual communication, and production (sending) of manual communication. Students were queried about their perception of the importance of each of these seven communication modes for three contexts: the importance of the skill to them (personally), the importance of the skill at NTID, and the importance of the skill in their future job. The students were also asked to indicate the strength of their desire for additional training in the seven communication skills. In addition to the 28 questions mentioned above (four for each of the seven modes), students were asked ten items about their perceived abilities in the communication modes. The perceived ability items were broken down into ten rather than seven modes to correspond to the way NTID measures communication ability (see Figure 1). The total instrument was therefore comprised of 38 items.

The primary focus of this portion of the study was to examine the effect of item response formats on student responses. Therefore the 38 items were written in two ways. Half of the students responded to a "Strongly Agree" to "Strongly Do Not Agree" five-option Likert response format. The other half responded to the same items in a multiple choice format. See Appendix for copies of both instruments and to see the correspondence of the items for each response format. Figure 1 gives a shortened version of the 38 items on the questionnaire. Please refer to Figure 1 whenever specific item numbers are mentioned during the discussion of the results. The order of the items was the same for both response formats. Only the item statements are given in Figure 1; the complete questionnaire using both response options are appended.

Analysis

1. Preliminary analysis showed no significant differences in the two groups of students (those who were asked to respond to the Likert format and those who were asked to respond to the multiple choice format) on a wide variety of demographic and aptitude variables, including sex, age, communication skills, math aptitude scores, etc. This data is not reported here.
2. A variety (24 to be exact) of exploratory factor analyses, both principal axis, and principal components with both orothogonal and oblique rotations were performed on the entire set of 38 items to determine the underlying dimensions of students' responses to the questionnaire. Based on these early analyses it was decided to remove the desire for training and perception of ability items and factor analyze only the perception of importance items.

1. It is important for me to speak well.
2. Receiving sign language well will be important in my future job.
3. I want training to improve my writing skills.
4. Good lipreading skills are necessary at NTID.
5. I want training to improve my speech skills.
6. It is important for me to write well.
7. Good reading skills will be important in my future job.
8. Good speech skills are necessary at NTID.
9. Good lipreading skills will be important in my future job.
10. It is important for me to read well.
11. I want training to improve my listening skills.
12. Good reading skills are necessary at NTID.
13. It is important for me to lipread well.
14. Good writing skills are necessary at NTID.
15. I want training to improve my reading skills.
16. It is important for me to receive manual communication well.
17. It is important for me to communicate with my hands well.
18. Reading manual language well is necessary at NTID.
19. Communicating with my hands will be important in my future job.
20. I want training to receive manual language better.
21. Good listening skills will be important in my future job.
22. Communicating with my hands well is necessary at NTID.
23. It is important for me to have good listening skills.
24. Good listening skills are necessary at NTID.

Figure 1. Abbrievated version of instrument used in study.

25. Good speech skills will be important in my future job.
26. I want training to communicate with my hands better.
27. Good writing skills will be important in my future job.
28. I want training to improve my lipreading skills.
29. When I read, I understand:
30. When I listen to a hearing person talk and I do not lipread, I understand:
31. When I lipread a hearing person and I do not hear or do not listen, I understand:
32. When I speak with my voice, hearing persons understand:
33. When I write, people understand:
34. When people use manual language (sign) but do not speak, I understand:
35. When I sign with my hands but do not speak, someone who signs understands:
36. When I communicate with my hands and voice, a hearing person who signs understands:
37. When I watch people sign with their hands, and I also lipread, I understand:
38. When I lipread a hearing person and I also listen, I understand:

Figure 1 (continued). Abbreviated version of instrument used in study.

3. The 21 perception of importance items were factor analyzed for each response format and items that contributed strongly to the factor were identified. Factor scales were then developed for the 21 items. Factor scales rather than factor scores were used because of the generally higher reliability of factor scales, the ease of computation, and the ease of interpretation. (See Armour, 1974 for a discussion of the relative merits of factor scores and factor scales.)
4. Four factor scales were developed for the 21 perceived importance items. Four companion scales of desire for training and four companion scales for perceived abilities were then logically developed. The resulting 12 factor scales are now called subscales, since the latter eight scales were logically, rather than factor analytically determined.
5. T-tests were conducted for each of the 12 subscales by response format to examine mean difference due to format.
6. Two group discriminant analyses were conducted using the 12 subscales to determine if format could be predicted by subscale scores.
7. Finally, a series of multiple regressions were performed for each format using the four importance subscales as predictors and the individual desire for training and perceived ability scales as the criterion.

Results

Comparison of Item Responses

Individual item means and standard deviations are presented in Table 1 for each of the two response formats. Please refer to Figure 1

TABLE 1

INDIVIDUAL ITEM STATISTICS FOR LIKERT AND MULTIPLE CHOICE RESPONSE FORMATS

Item	Likert Responses*		Multiple Choice Responses**	
	$\bar{x}$	SD	$\bar{x}$	SD
1	4.44	.83	4.52	.88
2	3.51	1.09	3.40	1.43
3	4.29	.86	4.18	.85
4	4.24	.78	4.28	1.10
5	4.18	1.06	4.18	1.04
6	4.43	.79	4.66	.62
7	4.62	.60	4.76	.66
8	4.13	.83	4.51	.86
9	4.42	.87	4.41	.96
10	4.39	.74	4.52	.91
11	3.73	1.16	3.83	1.06
12	4.32	.68	4.59	.81
13	4.27	.87	4.44	.95
14	4.22	.82	4.63	.70
15	4.23	.84	4.25	.84
16	3.79	1.15	3.96	1.22
17	3.86	1.06	4.01	1.13
18	3.83	.92	4.22	1.08
19	3.21	1.12	3.31	1.41
20	3.50	1.13	3.50	1.25
21	4.02	1.14	4.18	1.09
22	3.89	.85	4.35	1.01
23	3.83	1.22	4.09	1.25
24	3.74	1.05	4.19	1.07
25	4.47	.77	4.74	.66
26	3.52	1.11	3.30	1.35
27	4.52	.69	4.75	.60
28	4.22	.96	3.88	1.11
29	3.74	.74	3.89	.77
30	2.54	1.25	2.49	1.22
31	3.03	1.06	3.34	1.00
32	3.59	1.02	3.79	1.02
33	4.26	.81	4.23	.74
34	3.41	1.29	3.30	1.13
35	3.56	1.21	3.47	1.20
36	3.98	.93	4.05	1.00
37	4.08	.99	4.21	.79
38	3.75	1.11	3.78	1.04

*N = 146
**N = 142

to determine the items that correspond to a given item number. These 38 items comprised the set of items for the preliminary factor analysis. No other data analyses were performed on the original set of items and Table 1 is given for information only.

Development of Subscales

Based on the results of the preliminary factor analyses, it was decided to include only the 21 perceived importance items in a factor analysis and develop factor scales based on the results of that analysis. The 21 items were submitted to a principal axis factor analysis with rotation against the varimax criterion. For both response formats, four factors with eigenvalues greater than one were extracted, accounting for 95% of the total variance for the Likert response format and 93% of the total variance for the multiple choice response format. The four factors were inspected and factor labels were developed. Results of the principal axis analysis are displayed in Tables 2 and 3. The inter-item correlation matrices are not presented because of space considerations, but these as well as any other data mentioned but not reported in this paper are available from the authors upon request.

The four factors were labeled: Manual Communication, Speech and Lipreading, Listening, and Reading/Writing. Other factor analyses not reported here were performed to validate the existence of this four-factor structure for the 21 perceived importance items.

Once the four importance factors were determined, companion factors were developed for perceived ability and desire for additional training. This resulted in 12 dimensions or subtests. It was the scores for these dimension subtests that were used in the remaining analysis. Figure 2

TABLE 2

FOUR FACTOR STRUCTURE OF PRINCIPAL FACTOR ANALYSIS/VARIMAX ROTATION FOR LIKERT RESPONSE FORMAT

Item	Factors				Communality
	Manual Communication	Speech & Lipreading	Listening	Reading & Writing	
1	-.17	.57	.37	.21	.56
2	.65	-.01	-.04	-.01	.44
4	.23	.73	.13	.09	.62
6	.04	.04	-.01	.77	.60
7	.08	.11	.05	.32	.35
8	-.05	.59	.27	.24	.50
9	.14	.82	.00	-.02	.75
10	-.01	.02	.18	.55	.60
12	.16	.11	.06	.62	.55
13	.08	.84	.08	.03	.80
14	.13	.12	.18	.69	.54
16	.54	.08	.11	.08	.33
17	.86	.00	-.14	.07	.77
18	.70	.12	.07	.13	.54
19	.78	-.03	-.05	.03	.62
21	-.01	.14	.88	.00	.82
22	.65	.06	.04	.21	.47
23	-.04	.21	.89	.13	.85
24	.09	.26	.81	.09	.74
25	-.05	.60	.31	.14	.51
27	.16	.13	.00	.56	.36
Eigenvalue	5.06	3.23	1.92	1.52	
% of Variance	41.00	26.10	15.60	12.30	
Cum. % of Variance	41.00	67.20	82.70	95.10	

TABLE 3

FOUR FACTOR STRUCTURE OF PRINCIPAL FACTOR
ANALYSIS/VARIMAX ROTATION FOR MULTIPLE CHOICE RESPONSE FORMAT

Item	Factors				Communality
	Manual Communication	Speech & Lipreading	Listening	Reading &	
1	-.18	.48	.24	.46	.54
2	.77	-.16	.07	.00	.62
4	.04	.73	.13	.01	.56
6	.11	.16	.09	.65	.47
7	.05	.28	-.03	.43	.51
8	.09	.50	.21	.12	.41
9	.00	.48	.09	.23	.30
10	-.10	.13	.05	.68	.50
12	.11	.19	.12	.65	.52
13	-.03	.75	.11	.13	.59
14	.21	.05	.21	.50	.37
16	.70	.05	.01	.07	.53
17	.89	.09	-.10	.06	.81
18	.61	.08	-.06	.33	.53
19	.68	-.09	.03	-.19	.51
21	.00	.32	.66	.18	.57
22	.74	.04	-.13	.14	.60
23	-.16	.11	.86	.10	.78
24	.03	.35	.66	.14	.58
25	-.07	.55	.22	.19	.43
27	.05	.05	.04	.28	.85
Eigenvalue	4.79	3.51	1.02	1.54	
% of Variance	41.30	30.30	8.80	13.20	
Cum. % of Variance	41.30	71.50	93.60	84.80	

Subscale A: Manual Communication - Importance

Items 2. Receiving sign language well will be important in my future job.
16. It is important for me to receive manual communication well.
17. It is important for me to communicate with my hands well.
18. Reading manual language well is necessary at NTID.
19. Communicating with my hands will be important in my future job.
22. Communicating with my hands well is necessary at NTID.

Subscale B: Speech & Lipreading - Importance

Items 1. It is important for me to speak well.
4. Good lipreading skills are necessary at NTID.
8. Good speech skills are necessary at NTID.
9. Good lipreading skills will be important in my future job.
13. It is important for me to lipread well.
25. Good speech skills will be important in my future job.

Subscale C: Listening - Importance

Items 21. Good listening skills will be important in my future job.
23. It is important for me to have good listening (hearing) skills.
24. Good listening skills are necessary at NTID.

Subscale D: Reading/Writing - Importance

Items 6. It is important for me to write well.
7. Good reading skills will be important in my future job.
10. It is important for me to read well.
12. Good reading skills are necessary at NTID.
14. Good writing skills are necessary at NTID.
27. Good writing skills will be important in my future job.

Subscale A_1: Manual Communication - Training

Items 20. I want training to read (receive) manual language better.
26. I want training to communicate with my hands better.

Subscale B_1: Speech and Lipreading - Training

Items 5. I want training to improve my speech skills.
28. I want training to improve my lipreading skills.

Figure 2. Items that comprise the twelve subscales of the instrument used in study.

Subscale C_1: Listening - Training

Item 11. I want training to improve my listening skills.

Subscale D_1: Reading/Writing - Training

Items 3. I want training to improve my writing skills.
15. I want training to improve my reading skills.

Subscale A_2: Manual Communication - Ability

Items 34. When people use manual language (sign) but do not speak, I understand:
35. When I sign with my hands but do not speak, someone who signs understands:
36. When I communicate with my hands and voice, a hearing person who signs understands:
37. When I watch people sign with their hands, and I also lipread, I understand:

Subscale B_2: Speech and Lipreading - Ability

Items 31. When I lipread a hearing person and I do not hear or do not listen, I understand:
32. When I speak with my voice, hearing persons understand:

Subscale C_2: Listening - Ability

Items 30. When I listen to a hearing person talk and I do not lipread, I understand:
38. When I lipread a hearing person and I also listen, I understand:

Subscale D_2: Reading/Writing - Ability

Items 29. When I read, I understand:
33. When I write, people understand:

Figure 2 (continued). Items that comprise the twelve subscales of instrument used in study.

lists the items that comprise each dimension subtest and Tables 4 and 5 provide a variety of descriptive statistics for the dimension subtests for each response format.

T-Tests for Response Formats

Table 6 presents the results of separate t-tests for each of the 12 subscales and the total instrument. As can be seen from Table 6, only scales 3, 4 and 2A showed a significant mean difference at the .05 level. In general we can conclude that there is no real difference in the mean subscale scores between the two response formats. Table 6, however, also gives the reliability (internal consistency) estimates of all the subscales for each form. There we note a few differences, although the differences are not consistent. The reliability estimate used is the Hoyt Analysis of Variance Method (Hoyt, 1941). Internal consistency is an estimate of the extent to which each item taps whatever the survey is measuring.

In interpreting a reliability coefficient, what magnitude is "good"? In general, attitude surveys that yield internal consistency coefficients of .70 or better are considered acceptable. It is important to note that (other things being equal) the greater the number of items, the greater the internal consistency. An inspection of Table 6 shows us that the internal consistency estimates of all those subscales with three or more items are acceptable. As might be expected, those subscales consisting of only two items sometime fall below the acceptable range. Internal consistency coefficients cannot, of course, be computed for only one item.

TABLE 4

DESCRIPTIVE INFORMATION ON TWELVE SUBSCALES
AND TOTAL SCORES FOR LIKERT RESPONSE FORMAT

Subscale	Valid Cases	# of Items	$\bar{x}$	Standard Deviation	Minimum Score	Maximum Score	$\bar{x} \div$ N of Items
A	146	6	22.07	4.68	8.00	30.00	3.68
B	146	6	25.96	3.86	6.00	30.00	4.33
C	146	3	11.57	3.15	3.00	15.00	3.86
D	146	6	26.50	3.12	15.00	30.00	4.42
A_1	146	2	7.00	2.02	2.00	10.00	3.50
B_1	146	2	8.37	1.86	2.00	10.00	4.18
C_1	146	1	3.73	1.16	1.00	5.00	3.73
D_1	146	2	8.52	1.49	2.00	10.00	4.26
A_2	146	4	14.92	3.28	5.00	20.00	3.73
B_2	146	2	6.60	1.59	2.00	10.00	3.30
C_2	146	2	6.28	1.96	2.00	10.00	3.14
D_2	146	2	7.95	1.35	4.00	10.00	3.96
TOTAL	146	38	150.90	15.63	100.00	187.00	

TABLE 5

DESCRIPTIVE INFORMATION ON TWELVE SUBSCALES
FOR MULTIPLE CHOICE RESPONSE FORMAT

Subscale	Valid Cases	# of Items	$\bar{x}$	Standard Deviation	Minimum Score	Maximum Score	$\bar{x} \div$ N of Items
A	142	6	23.19	5.62	6.00	30.00	3.86
B	142	6	26.79	3.85	12.00	30.00	4.46
C	142	3	12.40	2.94	3.00	15.00	4.13
D	142	6	27.75	3.09	15.00	30.00	4.62
A_1	142	2	6.79	2.29	2.00	10.00	3.39
B_1	142	2	8.03	1.92	2.00	10.00	4.01
C_1	142	1	3.82	1.06	1.00	5.00	3.82
D_1	142	2	8.37	1.53	2.00	10.00	4.18
A_2	142	4	14.87	3.05	6.00	20.00	3.72
B_2	142	2	7.09	1.70	2.00	10.00	3.54
C_2	142	2	6.24	1.93	2.00	10.00	3.12
D_2	142	2	8.06	1.29	5.00	10.00	4.03
TOTAL TEST	142	38	153.41	14.99	102.00	187.00	

TABLE 6

t-TESTS AND HOYT ESTIMATES OF RELIABILITY FOR TWELVE SUBSCALES AND TOTAL SCALE SCORES FOR LIKERT AND MULTIPLE CHOICE RESPONSE FORMATS

Subscale	Likert Response Format*		Multiple Choice Format**		t-Value	Two-Tailed Probability of t-Value
	$\bar{x}$	Reliability Estimate	$\bar{x}$	Reliability Estimate		
A: Manual Communication - Importance	22.1	.85	23.2	.86	-1.83	.068
B: Speech & Lipreading - Importance	26.0	.87	26.8	.79	-1.81	.071
C: Listening - Importance	11.6	.92	12.4	.82	-2.30	.022
D: Reading & Writing - Importance	26.5	.81	27.7	.78	-3.48	.001
A_1: Manual Communication - Training	7.01	.78	6.80	.73	.86	.392
B_1: Speech & Lipreading - Training	8.37	.79	8.03	.75	1.53	.126
C_1: Listening - Training	3.73	---	3.82	---	- .69	.487
D_1: Reading & Writing - Training	8.52	.68	8.37	.74	.83	.408
A_2: Manual Communication - Ability	14.9	.72	14.9	.72	.14	.891
B_2: Speech & Lipreading - Ability	6.60	.34	7.09	.62	-2.51	.012
C_2: Listening - Ability	6.28	.57	6.24	.66	.18	.857
D_2: Reading & Writing - Ability	7.92	.65	8.06	.62	- .89	.375
TOTAL	149.9	.86	153.4	.84	-2.24	.026

*N = 146
**N = 142

Two Group Discriminant Analysis

Another way of looking at the relationship of subscale scores to response format is to determine how well a student's scores on the subscales can predict type of response format. In other words, if simply by knowing a student's subscale scores we can predict which response format the students completed, then we can say the response format does indeed make a difference. Tables 7 and 8 summarize the results of the two group discriminant analysis using the 12 subscale scores as predictor variables.

However, Table 7 and 8 indicate that the subscales can predict response format only slightly better than chance. Note especially the percent correctly classified. A random assignment to either group should give approximately 50% correct assignment. Although the Chi-Square test of differences between the groups is significant, still the canonical correlation indicates only about 12% of the variance in the subscale scores can be attributed to response format.

Multiple Regression

The final analysis conducted on the two response formats was a series of multiple regressions where the perceived importance subscales were used to predict the companion desire for training and perception of ability subscales. Tables 9 and 10 indicate the results of those multiple regressions. Two aspects of analysis should be noted by the reader. First, although a second subscale usually improves the prediction equation slightly, in all but one case the best predictor of the desire for additional training and perceived ability subscale is the companion perceived importance subscale.

TABLE 7

SUMMARY OF TWO GROUP STEPWISE DISCRIMINANT FUNCTION ANALYSIS FOR SUBSCALE SCORES

Step	Variable	F to Enter[a]	Wilks Lamda	Approximate Multivariate F for Test of Lamda[b]	Change in RAO's V[c]	Significance of Change in V	Standard Discriminant Function Coefficient Function I
1	D	12.081	.959	12.081*	12.082	.001	-.312
2	D_1	4.585	.944	8.409*	4.806	.028	----
3	B_2	2.901	.935	6.610*	3.096	.078	-.640
4	C_2	3.944	.922	5.995*	4.263	.039	.580
5	A	3.032	.912	5.447*	3.34	.068	-.733
6	A_1	3.234	.902	5.106*	3.611	.057	.530
7	A_2	4.282	.888	5.039*	4.85	.028	.340
8	C	3.385	.877	4.870*	3.912	.048	-.429
9	B_1	1.851	.872	4.548*	2.175	.140	.290
10	D_1 (removed)	.585 F(removed)	.873	5.050*	- .706	1.000	----
	Eigenvalue						.154
	Relative Percentage						100.000
	Canonical Correlation						.365

[a]Minimum F to enter - 1.00.

[b]Degrees of Freedom range from 1,286 on Step 1 to 8,279 on Step 10.

[c]Indicates increase in discrimination to that variable.

*p < .001

TABLE 8

PREDICTED CLASSIFICATION RESULTS AND CENTROIDS OF TWO GROUPS ON DISCRIMINANT FUNCTION USING SUBSCALE SCORES

Actual Response Format	N of Cases	Predicted Response Format		Centroid in Reduced Space
		Likert	Multiple Choice	
Likert	146	97 (66.4%)	49 (33.6%)	.350
Multiple Choice	142	48 (33.8%)	94 (66.2%)	-.360

Overall percent correct classification = 66.32%

TABLE 9

SUMMARY OF RESULTS OF MULTIPLE REGRESSION ANALYSIS OF LIKERT SCALE

Dependent Variable Subscale	Independent Variable	F to Enter	Multiple R	R^2	F Test from ANOVA
A_1	Subscale A	105.70	.66	.44	
	Subscale C	3.70	.67	.45	29.2308
	Subscale B	.05	.67	.45	
	Subscale D	.03	.67	.45	
B_1	Subscale B	88.30	.63	.39	
	Subscale A	7.50	.65	.42	27.19
	Subscale D	2.36	.66	.43	
	Subscale C	1.41	.66	.43	
C_1	Subscale C	88.90	.69	.48	
	Subscale B	7.70	.71	.51	38.42
	Subscale A	3.06	.72	.52	
	Subscale D	.09	.72	.52	
D_1	Subscale D	32.90	.46	.21	
	Subscale A	2.20	.47	.22	10.62
	Subscale C	1.70	.48	.23	
	Subscale B	.04	.48	.23	
A_2	Subscale A	34.60	.43	.18	
	Subscale D	3.80	.45	.20	9.32
	Subscale B	1.70	.46	.21	
	Subscale C	.08	.46	.21	
B_2	Subscale B	15.02	.39	.15	
	Subscale A	14.70	.47	.22	12.05
	Subscale C	4.50	.50	.25	
	Subscale D	.83	.50	.25	
C_2	Subscale C	49.50	.53	.28	
	Subscale A	13.20	.58	.34	24.47
	Subscale B	.02	.58	.34	
D_2	Subscale B	4.39	.26	.07	
	Subscale C	4.17	.30	.09	3.68
	Subscale D	.50	.31	.09	
	Subscale A	.14	.31	.09	

TABLE 10

SUMMARY OF RESULTS OF MULTIPLE REGRESSION ANALYSIS OF MULTIPLE CHOICE

Dependent Variable Subscale	Independent Variable	F to Enter	Multiple R	R^2	F Test from ANOVA
A_1	Subscale A	30.90	.40	.16	10.16
	Subscale C	9.30	.48	.23	
	Subscale D	.37	.49	.23	
	Subscale B	.08	.48	.23	
B_1	Subscale B	23.20	.32	.10	7.18
	Subscale A	6.20	.36	.13	
	Subscale D	5.04	.41	.17	
	Subscale C	1.05	.42	.17	
C_1	Subscale C	28.60	.40	.16	10.55
	Subscale A	4.30	.43	.18	
	Subscale D	.81	.43	.19	
D_1	Subscale D	7.10	.24	.06	2.72
	Subscale A	1.50	.27	.07	
	Subscale B	.18	.27	.07	
	Subscale C	.01	.27	.07	
A_2	Subscale A	45.90	.52	.27	14.18
	Subscale C	2.40	.53	.28	
	Subscale D	1.60	.54	.29	
	Subscale B	.10	.54	.29	
B_2	Subscale C	16.00	.47	.22	15.44
	Subscale B	9.70	.53	.28	
	Subscale A	5.70	.56	.31	
	Subscale D	.18	.56	.31	
C_2	Subscale C	32.70	.45	.20	12.95
	Subscale A	2.20	.47	.22	
	Subscale D	.08	.47	.22	
D_2	Subscale D	8.30	.34	.11	6.60
	Subscale B	2.50	.38	.15	
	Subscale C	1.20	.39	.15	
	Subscale A	.97	.40	.16	

Second, the Likert items appear to do a significantly better job of predicting the companion subscales than the multiple choice items. For both item formats, subscale D_2 (Perceived Ability in Reading and Writing) is not well predicted by perceived importance. Some of this lack of relationship can be explained by the relatively high perceived importance given to reading and writing while perceived abilities are more varied. (See also subscale D_1, Desire for Training in Manual Communication.) For the Likert response format, the desire for additional training subscales are predicted by the perceived importance subscales far better than the perceived ability subscales are predicted by the perceived importance subscales.

Discussion

This study examined the relationship between response format and student responses on a questionnaire about attitudes toward communication modes. Approximately one-half of the 1978 NTID entering freshman class responded to the questionnaire items written in a five category Likert response format (Strongly Agree to Strongly Disagree). The other half of the students responded to the same items only written in a multiple choice format.

After a series of exploratory factor analyses, it was decided to break the instrument down into 12 subscales. The first four subscales related to students' perceptions of the perceived importance of four broad modes of communication: manual communication (expressive and receptive); speech and lipreading (or speechreading); listening; and reading and writing.

A principal axis factor analysis with an orthogonal rotation was then completed for each response format using only the items that would logically comprise the four perceived importance subscales. Results of that factor analysis demonstrated that although both response formats generally demonstrated the desired dimension, the Likert response format yielded a slightly more interpretable simple structure. Only two items loaded factors where they did not logically belong. Item 25, "Good speech skills will be important in my future job," loaded .31 on listening as well as loading .60 on the speech and lipreading factor. Item 1, "It is important for me to speak well," also loaded on the listening factor as well as the speech and lipreading factor. Factors are most usually interpreted by using those items with loadings of .30 and above. With the multiple choice format, four items loaded on factors where they were not expected.

Although the results of the two factor analyses helped validate the existence of the four communication mode factors, the Likert response yielded a slightly cleaner result.

Once the perceived importance factors were verified, factor scales were developed for each student by simply running across the specified items. Companion subscales were then logically developed for desire for training and perceived ability by summing across appropriate items. Remaining analyses used these 12 subscale scores. Results of both t-tests (corresponding subscale means for each format) and a two-group discriminant analysis (using subscale scores to predict format) yielded no consistent and significant difference in the two response formats. Reliability (internal consistency coefficients) showed no real difference,

although there were slight advantages for the Likert format for perceived importance subscales.

Finally, a series of multiple regressions were performed using the four importance subscales to predict the desire for training and perceived ability scores. This analysis yielded more interesting results. First, the Likert format showed a definite advantage over the multiple choice format in predicting most of the eight subscales in question. Second, for both formats, the best predictor consistently was the companion subscale. In other words, perceived importance of manual communication was a better predictor of desire for additional training in manual communications than any of the other three perceived importance subscales. The same holds true for perceived ability: importance of manual communication is a better predictor of perceived ability in manual communication than is perceived importance of any other communication mode.

Based on the results of this study, the Likert response format had a slight advantage over the multiple choice format based primarily on the interpretability of the factor structure and the ability of the perceived importance subscale to predict the desire for additional training subscales. The Likert format also showed slightly better reliability coefficients for the four perceived importance subscales. When the statistical results are added to the fact that the students can complete the Likert form in one-third to one-half the time, the Likert has distinct advantages.

Why this should be true is still speculation. Recent unpublished work in this area at NTID has shown that visual simplicity appears to be related to reliability in rating scales, even when the visually simple

form may seem to be conceptually more difficult. It is also possible that students are familiar with a Likert response format, since it is a commonly used format. In general, we can assume that it appears there is nothing inherent in the Likert response format that makes such a rating scale unsuitable for use with post-secondary deaf students and indeed there appears to be some limited advantage over the use of the more wordy multiple choice format.

APPENDIX

Copies of Instruments Used in Study

INTRODUCTION TO COMMUNICATION

Pre-Course Questionnaire

This questionnaire will help us improve this course. Please be honest. You will not be graded on this questionnaire.

Answer each of the following questions. Circle one letter for each question.

1. I think that speaking well is:

   A. Very important for me
   B. Somewhat important for me
   C. Only a little important for me
   D. Not at all important for me
   E. I do not know

2. I think that reading (receiving) sign language will be:

   A. Very important in my future job
   B. Somewhat important in my future job
   C. Only a little important in my future job
   D. Not at all important in my future job
   E. I do not know

3. You can get more training in writing at NTID.

   A. I definitely want that training
   B. I think I want that training
   C. I do not want that training
   D. I definitely do not want that training
   E. I do not know

4. I think that good lipreading skills are:

   A. Very important at NTID
   B. Somewhat important at NTID
   C. Only a little important at NTID
   D. Not at all important at NTID
   E. I do not know

5. You can get more training in speech at NTID.

   A. I definitely want that training
   B. I think I want that training
   C. I do not want that training
   D. I definitely do not want that training
   E. I do not know

6. I think that writing well is:

   A. Very important for me
   B. Somewhat important for me
   C. Only a little important for me
   D. Not at all important for me
   E. I do not know

7. I think that good reading skills will be:

   A. Very important in my future job
   B. Somewhat important in my future job
   C. Only a little important in my future job
   D. Not at all important in my future job
   E. I do not know

8. I think that good speech skills are:

   A. Very important at NTID
   B. Somewhat important at NTID
   C. Only a little important at NTID
   D. Not at all important at NTID
   E. I do not know

9. I think that good lipreading skills will be:

   A. Very important in my future job
   B. Somewhat important in my future job
   C. Only a little important in my future job
   D. Not at all important in my future job
   E. I do not know

10. I think that reading well is:

   A. Very important for me
   B. Somewhat important for me
   C. Only a little important for me
   D. Not at all important for me
   E. I do not know

11. You can get more training in listening at NTID.

   A. I definitely want that training
   B. I think I want that training
   C. I do not want that training
   D. I definitely do not want that training
   E. I do not know

12. I think that good reading skills are:

   A. Very important at NTID
   B. Somewhat important at NTID
   C. Only a little important at NTID
   D. Not at all important at NTID
   E. I do not know

13. I think that lipreading well is:

   A. Very important for me
   B. Somewhat important for me
   C. Only a little important for me
   D. Not at all important for me
   E. I do not know

14. I think that good writing skills are:

   A. Very important at NTID
   B. Somewhat important at NTID
   C. Only a little important at NTID
   D. Not at all important at NTID
   E. I do not know

15. You can get more training in reading at NTID.

   A. I definitely want that training
   B. I think I want that training
   C. I do not want that training
   D. I definitely do not want that training
   E. I do not know

16. I think that reading (receiving) manual language well is:

   A. Very important for me
   B. Somewhat important for me
   C. Only a little important for me
   D. Not at all important for me
   E. I do not know

17. I think that communicating with my hands well is:

A. Very important for me
B. Somewhat important for me
C. Only a little important for me
D. Not at all important for me
E. I do not know

18. I think that reading (receiving) sign language is:

A. Very important at NTID
B. Somewhat important at NTID
C. Only a little important at NTID
D. Not at all important at NTID
E. I do not know

19. I think that communicating with my hands will be:

A. Very important in my future job
B. Somewhat important in my future job
C. Only a little important in my future job
D. Not at all important in my future job
E. I do not know

20. You can get more training in reading (receiving) manual language at NTID.

A. I definitely want that training
B. I think I want that training
C. I do not want that training
D. I definitely do not want that training
E. I do not know

21. I think that good listening skills will be:

A. Very important in my future job
B. Somewhat important in my future job
C. Only a little important in my future job
D. Not at all important in my future job
E. I do not know

22. I think that communicating with my hands is:

A. Very important at NTID
B. Somewhat important at NTID
C. Only a little important at NTID
D. Not at all important at NTID
E. I do not know

23. I think that having good listening (hearing) skills is:

A. Very important for me
B. Somewhat important for me
C. Only a little important for me
D. Not at all important for me
E. I do not know

24. I think that good listening skills are:

A. Very important at NTID
B. Somewhat important at NTID
C. Only a little important at NTID
D. Not at all important at NTID
E. I do not know

25. I think that good speech skills will be:

A. Very important in my future job
B. Somewhat important in my future job
C. Only a little important in my future job
D. Not at all important in my future job
E. I do not know

26. You can get more training in communicating with your hands at NTID.

A. I definitely want that training
B. I think I want that training
C. I do not want that training
D. I definitely do not want that training
E. I do not know

27. I think that good writing skills will be:

A. Very important in my future job
B. Somewhat important in my future job
C. Only a little important in my future job
D. Not at all important in my future job
E. I do not know

28. You can get more training in lipreading at NTID.

A. I definitely want that training
B. I think I want that training
C. I do not want that training
D. I definitely do not want that training
E. I do not know

29. When I read, I understand:

A. Everything I read
B. Most of the message
C. About half of what I read
D. A few words
E. Nothing

30. When I listen to a hearing person talk and I do not lipread, I understand:

A. Everything he or she says
B. Most of the message
C. About half of the message
D. A few words
E. Nothing

31. When I lipread a hearing person and I do not hear or do not listen, I understand:

A. Everything he or she says
B. Most of the message
C. About half of the message
D. A few words
E. Nothing

32. When I speak with my voice, hearing persons understand:

A. Everything I say
B. Most of the message
C. About half of my message
D. A few words
E. Nothing

33. When I write, people understand:

A. Everything I write
B. Most of the message
C. About half of what I write
D. A few words
E. Nothing

34. When people use manual language (sign) but do not speak, I understand:

A. Everything
B. Most of the message
C. About half of the message
D. A few words
E. Nothing

35. When I sign with my hands but do not speak, someone who signs understands:

A. Everything I sign
B. Most of the message
C. About half of my message
D. A few words
E. Nothing

36. When I communicate with my hands and voice, a hearing person who signs understands:

A. Everything
B. Most of the message
C. About half of the message
D. A few words
E. Nothing

37. When I watch people sign with their hands, and also lipread, I understand:

A. Everything
B. Most of the message
C. About half of the message
D. A few words
E. Nothing

38. When I lipread a hearing person and I also listen, I understand:

A. Everything
B. Most of the message
C. About half of the message
D. A few words
E. Nothing

INTRODUCTION TO COMMUNICATION

Pre-Course Questionnaire

This questionnaire will help us improve this course. Please be honest. You will not be graded on this questionnaire.

PART A.

Read the following statements. Show how much you agree or do not agree with each statement. Circle one letter for each statement. These are your five choices:

A. I strongly agree
B. I agree
C. I have no opinion
D. I do not agree
E. I strongly do not agree

Example: I like to read.

Choice:	How you feel:	How you mark your answer:
A.	You strongly agree	(A) B C D E
B.	You agree	A (B) C D E
C.	You have no opinion	A B (C) D E
D.	You do not agree	A B C (D) E
E.	You strongly do not agree	A B C D (E)

PLEASE CIRCLE THE ANSWER THAT IS CLOSEST TO HOW YOU FEEL

		Strongly Agree	Agree	No Opinion	Do not Agree	Strongly Do Not Agree
1.	It is important for me to speak well.	A	B	C	D	E
2.	Reading (receiving) sign language well will be important in my future job.	A	B	C	D	E
3.	I want training to improve my writing skills.	A	B	C	D	E
4.	Good lipreading skills are necessary at NTID.	A	B	C	D	E
5.	I want training to improve my speech skills.	A	B	C	D	E
6.	It is important for me to write well.	A	B	C	D	E
7.	Good reading skills will be important in my future job.	A	B	C	D	E
8.	Good speech skills are necessary at NTID.	A	B	C	D	E
9.	Good lipreading skills will be important in my future job.	A	B	C	D	E
10.	It is important for me to read well.	A	B	C	D	E
11.	I want training to improve my listening skills.	A	B	C	D	E
12.	Good reading skills are necessary at NTID.	A	B	C	D	E
13.	It is important for me to lipread well.	A	B	C	D	E
14.	Good writing skills are necessary at NTID.	A	B	C	D	E
15.	I want training to improve my reading skills.	A	B	C	D	E
16.	It is important for me to read (receive) manual communication well.	A	B	C	D	E

	Strongly Agree	Agree	No Opinion	Do Not Agree	Strongly Do Not Agree
17. It is important for me to communicate with my hands well.	A	B	C	D	E
18. Reading manual language well is necessary at NTID.	A	B	C	D	E
19. Communicating with my hands will be important in my future job.	A	B	C	D	E
20. I want training to read (receive) manual language better.	A	B	C	D	E
21. Good listening skills will be important in my future job.	A	B	C	D	E
22. Communicating with my hands well is necessary at NTID.	A	B	C	D	E
23. It is important for me to have good listening (hearing) skills.	A	B	C	D	E
24. Good listening skills are necessary at NTID.	A	B	C	D	E
25. Good speech skills will be important in my future job.	A	B	C	D	E
26. I want training to communicate with my hands better.	A	B	C	D	E
27. Good writing skills will be important in my future job.	A	B	C	D	E
28. I want training to improve my lipreading skills.	A	B	C	D	E

PART B.

Read the following statements. Answer each question. Circle one letter for each statement.
These are your five choices:

A. Everything
B. Most of the message
C. About half the message
D. A few words
E. Nothing

	Everything	Most	About Half	A Few Words	Nothing
1. When I read, I understand:	A	B	C	D	E
2. When I listen to a hearing person talk and I do not lipread, I understand:	A	B	C	D	E
3. When I lipread a hearing person and I do not hear or do not listen, I understand:	A	B	C	D	E
4. When I speak with my voice, hearing persons understand:	A	B	C	D	E
5. When I write, people understand:	A	B	C	D	E
6. When people use manual language (sign) but do not speak, I understand:	A	B	C	D	E
7. When I sign with my hands but do not speak, someone who signs understands:	A	B	C	D	E
8. When I communicate with my hands and voice, a hearing person who signs understands:	A	B	C	D	E
9. When I watch people sign with their hands, and I also lipread, I understand:	A	B	C	D	E
10. When I lipread a hearing person and I also listen, I understand:	A	B	C	D	E

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